

30 December 1975

MEMORANDUM FOR THE RECORD

SUBJECT: Meeting with AMPEX on 18 December 1975

1. The following people were present at the meeting:

AMPEX

Milan Telian
Fred Wydler
Tracy Wood
William Slingland
Diane Lemos

AGENCY

H. Fitzwater,

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2. Mr. Telian opened the meeting, he said AMPEX would present a detailed analysis of the Redwood City PSAT and then address the other items listed in the 4 December letter from [redacted] to the AMPEX Corporation. Reproductions of all slides used by AMPEX during the meeting are attached to this report.

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3. Mr. Slingland presented a series of slides and much commentary that summarized the AMPEX view of the results of the Redwood City PSAT. He stressed that AMPEX believed that PSAT was a "joint discovery" exercise which would present the system "as it was" and see where we are and what it will take to go on. He went on to say that the PSAT required "perfect" hardware, that the tests had extensive interdependencies, and that there were functions tested that were not included in release 1. Mr. [redacted] asked when this condition had been discovered, the answer was in October. (The tests were delivered in August, a revised set was delivered in October.)

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4. Mr. Slingland made a strong point that the hardware errors were much reduced on the fifth day of the PSAT. This improvement was because of an adjustment that was made to the data Channel and due to the installation of a software feature that causes data to be read immediately after it has been written to tape. This was the start of their tactic to show an ability to resolve problems quickly rather than explain why they were so unprepared for PSAT. The rest of Mr. Slingland's presentation summarized the number and types of failures experienced at the Redwood City PSAT. The AMPEX summary showed a total of

sixty-four failures, forty-six were hardware related and eighteen were software related. Mr. Slingland claimed that eleven of the software failures were fixed either during or immediately after PSAT and that six were related to recovery functions and thus should not have been tested at the PSAT.

STAT 5. Messrs [] disagreed with AMPEX interpretation of recovery functions, a separate report on this problem is being prepared. The points that were contended are listed below:

- a. Data that cannot be moved from disk to tape by the Mass Storage System but which can be successfully read by problem programs executing in a host computer.
- b. Data files that have records that overflow a disk cylinder boundary.
- c. Reserve of a shared disk unit.
- d. Allocation lockout, space deallocated on disk without MSS notification, wait loop for space.
- e. Display file abort-allocation lockout.
- f. Software time out to TDP after last interrupt.
- g. Incorrect MFD entries due to manual restart procedures.
- h. MSS sent incorrect message to host then hung looping.
- i. Automatic demark.

6. Mr. Slingland presented a slide that summarized the forty-six hardware failures. Twenty-six failures were associated with moving data from disk to tape, twenty of these occurred in the first four days before AMPEX fixed the hardware and software, the remaining six failures were claimed to be related to recovery and thus not appropriate for the PSAT. Ten failures were associated with moving data from disk to tape, these all occurred within the first four days and an implication was left that this problem is now permanently cured. Two failures were caused by a communication interface unit between the SCP and EDCP and eight failures were caused by a faulty interrupt handling design which AMPEX says is now fixed.

STAT 7. [] noted that the large number of hardware errors had prevented the Agency from running all of the tests of the Release 1 software functions. Just over half of the software functions planned to be tested were actually tested at the PSAT. Mr. Slingland said that the Redwood City hardware consists of prototype units and is not the equipment that will be delivered to the Agency. No mention was made of the extensive effort AMPEX allocates to this equipment, it is also important to note that the AMPEX programmers say the Redwood City hardware performs better than that at Sunnyvale.

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8. Mr. Wood presented a detailed discussion of the hardware problems encountered at PSAT. He reviewed four slides that broke out the types of failures, in what test session the failures occurred, the corrective actions taken by AMPEX, and the reason if none were taken which invariably was because the failure was recovery related and should not have been tested at PSAT. The Agency's position is that the failures noted by AMPEX are not recovery related but rather normal error handling that should already be completed.

9. When Mr. Wood was questioned about some of the hardware failures, he admitted that the tape used in the test had bad spots and also had not been completely pre-tested as had been requested. He said that the function of detecting bad areas on tape during a normal write process was not a PSAT function. October reporting by AMPEX described this function's status as completed. July reporting also stated it as complete and that it was planned to be tested at PSAT. It seems to me that the problem here is that the tally track hardware is not finished and AMPEX does not want to make this admission. Further discussion of the hardware problems resulted in both Messrs Wood and Telian admitting that AMPEX was unprepared for PSAT.

10. Mr. Wood described the hardware failures caused by the communications interface between the SCP and EDCP, the Channel Simulator, and a missing wire in the Transport Driver Interface Unit. [redacted] asked if AMPEX had diagnostics to find missing wires. AMPEX did not directly answer the question. [redacted] then continued and said the Agency is concerned about hardware reliability.

11. The last part of Mr. Wood's presentation was a discussion of error rates. He stated that the unrecoverable or hard error rate is 1 byte for each 2.5 billion bytes read (transferred from tape to disk). He said that based on the daily volume of data stated in the Mass Storage System Design that we should expect approximately two such errors per day. He also said that there was not a high enough volume of data to make any meaningful statistical evaluation of the error rate observed during the Redwood City PSAT. Finally, he noted that of all data successfully read during PSAT, there were no data compare failures. The fact remains that eleven out of seventy files were lost during PSAT because of various errors.

12. The points made by Mr. Wood during his presentation were the same as those made by Mr. Slingland. Yes there were failures, in this case hardware, but they had been corrected

either during PSAT or immediately after and those that were not corrected are related to recovery functions which are not a part of PSAT. The Agency does not agree with Mr. Wood's interpretation of the recovery functions.

13. The next presentation given by Mrs. Lemos, concerned an analysis of the PSAT software failures. She reviewed a selected set of errors and claimed they had been corrected either during or immediately after the PSAT. The remainder were all categorized as related to recovery functions which were not to be tested at the Redwood City PSAT. Messrs [redacted] disagreed with Ampex's interpretation that these failures were related to the recovery functions as specified in section 6 of the MSS Design document.

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14. Mr. Telian summarized the Ampex presentations thus far and admitted that the PSAT had not satisfied the contractual milestone. However, he continued that in Ampex's view they had demonstrated a basic capability of the MSS hardware and software to do the functions specified. He went on to say that there was a misunderstanding about the content of PSAT and no agreement as to its content. This situation had led to AMPEX and the Agency viewing the results differently. He then proposed a technical meeting in early January for the purpose of reaching agreement and for scheduling another PSAT. Mr. [redacted] said that before the Government agrees to anything, we would like to hear the rest of Ampex's presentation.

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15. Ampex then went on to address the four design items that the Government had stated appeared to be contrary to the system specifications. Mr. Slingland presented the Ampex position on each item with the aid of four slides.

Item 1 was entitled, "Concurrent access to individual transport drivers from both storage control processors". Ampex said that this type of access was not required by the contract or specification. To support this stand a cabling diagram in the MSS Design was referenced and also a section on Oracle Maintenance and Diagnostics. Mr. [redacted] argued that the MSS Design specifically states that an SCP and a transport driver must be capable of operating in off-line mode, and the only way this capability is possible is for Ampex to supply concurrent accessing. Mr. Wood appeared to agree that the Government's argument was irrefutable. Mr. [redacted] pointed out our desire

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to be able to split the system for maintenance, development and debugging which would be impossible without this feature.

Item 2 was entitled, "Maximum hardware configuration of 6 TD's, 64 Tape Transporter, 3 DC's, and 6 EDCP's does not have "perfect switching" capability." Ampex said they would provide a "perfect switching" capability when the agency orders a maximum configuration. Mr. [] argued that the MSS General System Specification called for perfect switching for all hardware configurations that did not exceed standard configuration of 6 TD's, 64 Transports, 3 DC's, and 6 EDCP's. Ampex claimed that the MSS Design document negated this contention. Messrs [] and [] pointed out that the MSS Design document is primarily a software specification and that the hardware specifications which exist in other documents were not meant to be repeated in the MSS Design.

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Item 3 was entitled, "A storage control processor requires a dedicated disk controller to access the MSS private files". The Ampex position on this item was that the MSS can operate with a shared BSS/MSS controller, however, they recommend that a dedicated controller be used for performance reasons. The Government stated that the system design specifies controllers are shared for access to the BSS and to the private files.

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Item 4 was entitled, "Functions are not split and/or shared between the two (2) storage control processors". Ampex addressed this item by trying to justify their design switch to a single SCP mode. They admitted erring in not advising the Government sooner. In spite of this admission, Mr. Slingland then said the SCP software function split is not described in the contract. [] refuted this by citing several references where the master-slave split is described in much detail. The slide accompanying item 4 also states that the Ampex "cost-to-complete" estimate used to negotiate the selling price assumed a single SCP approach. If this is true, why wasn't the specification changed at the same time.

16. Mr. Wydler, continued to justify Ampex position for developing a single SCP system. He said that all of the 1975 software development was based on this concept. He gave several unusual arguments for the concept; higher reliability, MTTR improved, SCP failure no degradation and more (see the slide). Mr. [] noted that none of these arguments were advantageous and also reminded Mr. Wydler that Ampex justified developing SCPOS on the basis of a dual SCP system. Mr. Wydler had obviously exhausted his knowledge of the subject and did not respond. Lastly, Mr. Wydler said that the single SCP system

will be supported for the general market, leaving the implication that a dual system as called for by the specification could make that system a one-of-a-kind product.

17. After Mr. Wydler's presentation, Mr. [] then asked Ampex about their schedule projections. Mr. Telian said that schedules will have to be ignored until the Redwood City and Sunnyvale PSAT's have been agreed upon. Mr. [] then asked when will you deliver the system assuming the system design Ampex argued for. Mr. Telian said Ampex cannot discuss schedules with meaningful significance until they satisfy PSAT. Mr. [] again asked when can we expect delivery. Mr. Telian responded with a no comment and then continued that without further discussion about the issues that we are divided on, Ampex cannot tell us anything about going on with the project. Ampex then requested time for a caucus which lasted an hour.

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18. Mr. Telian presented the Ampex position. He said that Ampex intends to live up to and abide by the contract. Ampex realizes that it is important to deliver a useable system not only for the Agency but it is important for market considerations as well. He went on to say it is obvious that more research must be done to clarify the positions raised in the meeting. He emphasized that the first six months of 1975 were spent on design and only two days were spent to research the exceptions list in amendment five. Their haste in doing that may have caused Ampex to miss some things that got into the renegotiated amendment. Until that research is done, Ampex cannot say anything about schedules. (My comment is that if Ampex had really spent 6 months on design there would not be any problems today.)

19. After making the above statements, Mr. Telian then displayed a slide entitled, "TMS-2 Delivery Schedule", which contained several vague generalities. However, in his discussion, Mr. Telian said that the Sunnyvale PSAT would be complete in May 1976, the hardware would be shipped in July 1976, and final acceptance testing would start on November 30, 1976.

The contractual date for starting final acceptance is May 1976, thus the November date represents a slip of six months. The schedule was made just six months ago in June 1975. The November date also represents the Ampex interpretation of the system which is less than that described in the contracts.

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STAT 20. Mr. [] asked Mr. Telian to assess the impact on the schedule if Ampex complies with the Government's view of the four disputed areas. Mr. Telian said he could not answer until early January.

21. The meeting adjourned.

[]
COTR, Project ORACLE

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TMS-2 MASS STORAGE SYSTEM

REDWOOD CITY PSAT BACKGROUND

"JOINT DISCOVERY" APPROACH BELIEVED BENEFICIAL IN UNDERSTANDING OVERALL SOFTWARE DEVELOPMENT PROGRESS.

AS A RESULT, AMPEX MODIFIED OWN PREPARATION GROUND RULES TO MEET NOVEMBER 19 SCHEDULE.

EXTENSIVE TEST DEPENDENCY REQUIRED "PERFECT" HARDWARE OPERATION OR "RECOVERY/WARM START" CAPABILITIES NOT ANTICIPATED IN RELEASE 1.

INORDINATE NUMBER OF ASCEND/DESCEND FAILURES OCCURRED FIRST FOUR(4) DAYS OF TESTING.

DRAMATIC IMPROVEMENT IN SYSTEM RELIABILITY AFTER INSTALLATION OF READ-VERIFY AND DATA CHANNEL ADJUSTMENT.

12-16-75

REDWOOD CITY PSAT SUMMARY

TWENTY(20) TEST SESSIONS DURING SEVEN(7) DAY PERIOD,
NOVEMBER 19-25, 1975.

APPROXIMATELY THIRTY-ONE(31) HOURS OF TESTING, INCLUDING
EIGHT(8) HOURS STAND ALONE.

DESCEND DATA - DISK TO TAPE

TOTAL ATTEMPTS	231
SUCCESSFUL	205
FAILED BEFORE CORRECTIVE ACTION	20
FAILED AFTER CORRECTIVE ACTION (ALL RECOVERY RELATED)	6

ASCEND DATA - TAPE TO DISK

TOTAL ATTEMPTS	126
SUCCESSFUL	116
FAILED BEFORE CORRECTIVE ACTION	10
FAILED AFTER CORRECTIVE ACTION	0

CONCLUSION - NO FILES LOST AFTER CORRECTIVE ACTION IMPLEMENTED.

12-16-75

TMS-2 MASS STORAGE SYSTEM

RWC PSAT OVERVIEW

FAILURE - CORRECTIVE ACTION SUMMARY

SIXTY-FOUR(64) OCCURRENCES IDENTIFIED

FORTY-SIX(46) - HARDWARE RELATED

EIGHTEEN(18) - SOFTWARE RELATED

ALL PROBLEMS DIAGNOSED AND,

1. FIXES IMPLEMENTED FOR ALL RELEASE 1 FEATURES EXCEPT SET SEGMENT SIZE < 10 SCHEDULED FOR FINAL.
2. REMAINING ITEMS ALL RELATED TO RECOVERY AND SCHEDULED FOR FINAL RELEASE.

12-16-75

RWC PSAI SUMMARY

HARDWARE RELATED FAILURES - 46

TWENTY-SIX(26) OCCURRENCES

DESCENDING DATA FROM DISK TO TAPE

- TWENTY(20) PRIOR TO INSTALLATION OF FIXES.
- SIX(6) AFTER "READ VERIFY" SOFTWARE AND DATA CHANNEL ADJUSTMENT. ALL RELATED TO RECOVERY NOT SUPPORTED BY RELEASE 1.

TEN(10) OCCURRENCES

ASCENDING DATA FROM TAPE TO DISK

- NONE AFTER FIXES INSTALLED.

TWO(2) OCCURRENCES

DA-11 DEC INTERFACE BETWEEN SCP & EDCP

- REPLACED HARDWARE.
- RANDOM FAILURE.

EIGHT(8) OCCURRENCES

CHANNEL SIMULATOR/TRANSPORT DRIVER INTERRUPT HANDLING DESIGN
ERROR CAUSED HARD SYSTEM ABORTS

- CORRECTIVE ACTION IMPLEMENTED.

RWC PSAT SUMMARY
SOFTWARE RELATED FAILURES - 18

o TWELVE(12) OCCURRENCES

FUNCTIONAL DEFICIENCIES IN RELEASE 1 SOFTWARE

- ELEVEN(11) CORRECTIVE ACTION IMPLEMENTED, INSTALLED, AND TESTED OK.
- ONE(1) (SET SEGMENT TIME LIMIT 10) PARTIAL CAPABILITY IN PLACE BALANCE FOR FINAL RELEASE.

o SIX(6) OCCURRENCES

FINAL RELEASE RECOVERY IMPLICATIONS.

12-16-75

SUMMARY OF PSAT HARDWARE EVENTS

	Occurrences
Descend Failures	26
Ascend Failures	10
DA11 Between SCP & EDCP	2
SA11 & TDIF Interrupt Processing	8

TCW
12/17/75

1 0 0 ---
2 23 Approved For Release 2004/10/28 : CIA-RDP80-01794R000100230003-3
3 31 0 100% ---
4 3 3 0% (3) Reason I
5 0 0 ---
Software Modification READ VERIFY INSTALLED
6 3 3 0% (2) Reason II
(1) Reason I
7 10 3 77% (3) Reason I
8 41 10 80% (4) Reason I
(6) Reason II
Hardware Modification DATA CHANNEL ADJUSTED
9 15 2 88% (2) Reason I
10 0 0 ---
11 23 0 100% ---
12 0 0 ---
13 20 1 95% (1) Reason IV
14 21 1 95% (1) Reason I
15 0 0 ---
16 18 2 89% (2) Reason III
17-20 21 0 100% ---

ASCEND SUMMARY

SESSION	# ASCENDS	# FAILURES	% SUCCESSFUL	COMMENTS
1-2	0	0	---	---
3	20	1	95%	(1) Reason II or V
4	6	2	67%	(2) Reason II or V
5	0	0	---	---
Software Modification				READ VERIFY INSTALLED
6-7	0	0	---	---
8	23	7	77%	(1) Reason VII (5) Reason V (1) Reason VI
Hardware Modification				DATA CHANNEL ADJUSTED
9-20	77	0	100%	No file loss after Read Verify installed and Data Channel alignment modification made.

REASONS

- (15) Reason I -Bad tracks existed at two locations on BSS001. Handling of these tracks is a recovery function, not planned for PSAT. Specific tracks were: Cylinder 28, Track 8 & Cylinder 288, Track 5.
- (11) Reason II -Data Channel Read electronics improperly set-up to handle drop-outs. Found prototype unit requires separate set-up procedure. Adjusted R11 on Assembly 6211540 to eliminate errors.
- (2) Reason III -Overflow record which spanned cylinder boundary. Error recovery function not planned for PSAT.
- (1) Reason IV -Demarkable block found. Recovered on retry at different tape location. Automatic demark not PSAT function.
- (7) Reason V -Read Verify function required as part of each Descend operation. Installed for usage after Session #5.
- (1) Reason VI -Data Channel wire found disconnected after PSAT at Pin 22, J2, of Assembly 621139. This file was recoverable after reconnecting this wire.
- (1) Reason VII -Reserve failure. Recovery not supported for PSAT.

OTHER HARDWARE FAILURES

DA11-B Two failures attributed to malfunction of this device.
Replaced first portion after Session #1, remainder after
Session #4.

SA11/TDIF Eight (8) failures attributed to inability of SA11 and TDIF
Interrupt hardware to properly handle simultaneous interrupts. Miss-
Handling ing wire added to SA11. TDIF design modified. Solution
implemented and fully tested.

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PSAT ASCEND & DESCEND SUMMARY

	<u>DESCEND</u>	<u>ASCEND</u>
Sessions 1-20:		
Attempted	231	126
Completed	205	116
Failed	26	10
Success Ratio	89%	92%

Sessions 9-20:		
Attempted	118	77
Completed	112	77
Failed	6	0
Success Ratio	95%	100%

CONCLUSIONS:

- No file loss on Ascend after Read Verify and Data Channel change implemented.
- All Descend failures are attributable to recovery functions not supported for PSAT.

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• ABILITY TO PROCESS FILES

MSS Design Specification

Provides, in Figure 12, detailed analysis of representative MSS activity.

Ampex considers this a performance specification against which the final System can be tested.

• SYSTEM AVAILABILITY

MSS Design Specification

Section 11.5 guarantees System up-time in excess of 95%.

• DATA RELIABILITY

ORACLE MSS System

Proposal defines dependencies in Section 12.2 of accuracy on media reliability. This translates into the following set of requirements:

WRITE (DESCEND)

- Qualified Tape Only
- Read Verify
- Automatic Demark

READ (ASCEND)

- Reread
- Extended Recovery Procedures

NOTE: All data reliability figures assume the above procedures have been followed. In any test where data reliability is to be measured, the test size must be at least $10 \times$ the lowest common denominator in the rate. To measure rate of 1 error/ 2.5×10^9 bytes, at least 2.5×10^{10} bytes should be read during that period.

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TMS1 "TABLON" SYSTEM PERFORMANCE

REF. PROPOSAL 9-2

LEVEL A/B PERFORMANCE SUMMARY

Calendar:

Level A 3/22-4/29/72 (326 Hours) 926 Hours
 Level B 10/31/12/8/72 (600 Hours)

Activity:	<u>ACTUAL</u>	<u>SPECIFICATION</u>	<u>MARGIN</u>
Bits Written:			
Multi-Blk	0.39×10^{12}		
Single-Blk	0.41×10^{12}		
Total	0.80×10^{12}		
Bits Read:			
Multi-Blk	2.89×10^{12}		
Single-Blk	1.92×10^{12}		
Total	4.81×10^{12}		
R/W Total	5.61×10^{12}	0.77×10^{12}	7.3
Bulk Updates-in-Place	55121		
Reread Rate (for error recovery)	0.4/1000 Blks	4.0/1000 Blks	10.0
*Unrecoverable Error Rate	1.5×10^{-11}	5×10^{-11}	3.3
Block Demark Rate:			
Tape Pretest	0.009%	1%	111
After Pretest	0.0045%		222
Tape Life (Reads to Block Failure)	3020	1200	2.5

INTERPRETATION OF SPECIFIED ERROR RATES

- UNRECOVERABLE ERROR RATE

$$\text{RATE} = 5 \times 10^{-11} = \frac{1}{2 \times 10^{10}} = \frac{1}{8 \times 2.5 \times 10^9}$$

(1)

RATE = 1 ERROR OCCURRENCE/2.5 BILLION BYTES READ

- HARD ERRORS/DAY

$$\begin{aligned} \text{RATE} &\approx (\text{ERROR RATE}) (\text{TOTAL DATA TRANSFERRED PER DAY}) \\ &= (1/2.5 \times 10^9) \overset{(2)}{(5.2 \times 10^9)} \approx 2 \end{aligned}$$

RATE \approx 2 FAILURES/DAY

(1) RFP, Page 8 f).

(2) Table 12, ISS Design Spec.

SUMMARY OF SOFTWARE ERRORS

<u>Session #'s</u>	<u>Occurrences</u>	<u>Description</u>	<u>Fix Implemented</u>
2	2	- Error messages & completion messages not printed on flush command.	Fixed during PSAT
4	1	• "Setup complete" message in error should have been "breakdown complete". Interpreter cancelled job.	Fixed during PSAT
4	1	- Segment time limit currently at 10 instead of 1. File transfer segmentation limit currently at 17 segments for descend-disallowing large files.	Final release (RI limited)
4	1	◆ SRQ full - request queue filled with job stream \$1803MBL - set up for Biggie 1,2,3, & 4. Messages prioritized during PSAT to drop low priority information only when full. Final system will have sufficient space.	Partial fix during PSAT
7	1	◆ Flush failure - nothing happened. Software timeout to TDP after lost interrupt. Error recovery will correct this.	Final release
9	1	◆ MSS aborted - incorrect MFD entries due to manual restart procedures. Error recovery will correct this.	Final release
10	1	◆ MSS sent incorrect message to host then hung looping. Manual restart procedure and incorrect MFD entries. Error recovery will correct this.	Final release

Key: ◆ Hard failure - caused system abort or required IPL to continue
 • Incorrect operation - system did not function to specification
 - Interpretation of operation - no files lost, jobs ran ok

<u>Session #'s</u>	<u>Occurrences</u>	<u>Description</u>	<u>Fix Implemented</u>
13	1	• File conflicts. WM logic erroneously treated DISP on file required for 3 steps of a job.	Fixed during PSAT
13,16	3	• Priority conflicts - LIFO instead of FIFO within priority.	Fixed after PSAT
13	1	• Non-recognition of change in BSS configuration unless MSGØ91 received at IPL time.	Fixed after PSAT
17,18,19	3	• Deallocation did not stop - min/max logic not functioning correctly.	Fixed after PSAT
17	1	◆ Allocation lockout, space de-allocated on disk without MSS notification, wait loop for space. Error recovery will handle this.	Final release
20	1	◆ Display file abort - allocation lockout, op command had conflicting information on aborted. Error recovery will handle this.	Final release

Key: ◆ Hard failure - caused system abort or required IPL to continue (6)
 • Incorrect operation - system did not function to specification (9)
 - Interpretation of operation - no files lost, jobs ran ok (3)

TMS-2 MASS STORAGE SYSTEM

ACTION ITEM 1 - OCTOBER REVIEW

o ISSUE:

CONCURRENT ACCESS TO INDIVIDUAL TRANSPORT DRIVERS FROM BOTH STORAGE CONTROL PROCESSORS.

o AMPEX POSITION:

NOT REQUIRED BY CONTRACT OR SPECIFICATION.

o RATIONALE:

1. TRANSPORT DRIVER INTERFACE (TDIF) DESIGN ENABLES ONLY ONE TDIF TO BE IN CONTROL OF THE SCP/TD INTERCONNECT BUSS AT ANY GIVEN TIME.
2. MSS DESIGN/SPECIFICATION CABLE DIAGRAM ON PAGE 172 INDICATES SINGLE CABLE.
3. ARCHITECTURE CONFIRMED VIA "ORACLE MAINTENANCE AND DIAGNOSTICS" ON PAGE 150, PARAGRAPH 2.

WMS

12-15-75

WMS-2 MASS STORAGE SYSTEM

ACTION ITEM 2 - OCTOBER REVIEW

o ISSUE:

MAXIMUM HARDWARE CONFIGURATION OF 6 TD's, 64 TAPE TRANSPORTS, 3 DC's, AND 6 EDCP's DOES NOT HAVE "PERFECT SWITCHING" CAPABILITY.

o AMPEX POSITION:

WILL PROVIDE "PERFECT SWITCHING" CAPABILITY WHEN AGENCY ORDERS MAXIMUM HARDWARE CONFIGURATION.

WMS

12-15-75

3-2 MASS STORAGE SYSTEM

ACTION ITEM 3 - OCTOBER REVIEW

o ISSUE:

A STORAGE CONTROL PROCESSOR REQUIRES A DEDICATED DISK CONTROLLER TO ACCESS THE MASS STORAGE SYSTEM'S PRIVATE FILES.

o AMPEX POSITION:

THE TMS-2 MSS CAN OPERATE WITH A SHARED BSS/MSS CONTROLLER. AMPEX RECOMMENDS A DEDICATED DISK CONTROLLER FOR PERFORMANCE CONSIDERATIONS.

o RATIONALE:

1. DEDICATED DISK AND CONTROLLER INCLUDED IN ORIGINAL PROPOSAL PAGE 4-5 AND IN MSS DESIGN/SPEC PAGE 7-8.
2. SYSTEM ARCHITECTURE IS SUCH THAT IN A TWO(2) CONTROLLER SYSTEM AS PROPOSED BY THE AGENCY WHEN BOTH EDCP'S ARE CONNECTED AND STAGING FILES, SCP CANNOT ACCESS PRIVATE DISKS FOR FILE REQUEST PROCESSING.

WMS

12-15-75

IMS-2 MASS STORAGE SYSTEM

ACTION ITEM 4 - OCTOBER REVIEW

o ISSUE:

FUNCTIONS ARE NOT SPLIT AND/OR SHARED BETWEEN THE TWO(2)
STORAGE CONTROL PROCESSORS.

o AMPEX POSITION:

1. HIGH CONFIDENCE THAT SOFTWARE RESIDENT IN A SINGLE SCP
WILL MEET SYSTEM PERFORMANCE NEEDS.
2. PRIMARY REASON FOR SECOND SCP IS SYSTEM REDUNDANCY.
3. AMPEX ERRED, SHOULD HAVE ADVISED AGENCY SOONER.

o RATIONALE:

1. SCP NOT LIMITING ELEMENT IN SYSTEM PERFORMANCE.
2. AMPEX "COST-TO-COMPLETE" ESTIMATE USED TO NEGOTIATE
CEILING PRICE ASSUMED SINGLE SCP APPROACH.

WMS

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S/W SYSTEM FOR SINGLE SCP

o 1975 SOFTWARE DEVELOPMENT BASED ON THIS CONCEPT.

o PERFORMANCE

SPEC'D PERFORMANCE CAN BE MET OR EXCEEDED WITH THIS CONCEPT.
BOTH FOR PRESENT AND EXPANDED CONFIGURATION. AMPEX CONFIDENCE -- VERY HIGH!!

PERFORMANCE LIMITS: 1 DSS (SEARCHES)
2 PRIVATE DISK (SEEKS)
3 SCP CORE MEMORY
4 SCP CYCLES

ALSO, HOST OVERHEAD, ETC.

o ADVANTAGES

- OVERALL SYSTEM MORE RELIABLE (LESS ACTIVE HARDWARE)
- MTTR IMPROVED (A/B TESTS, SPARES CONSIDERATIONS)
- IN CASE OF COMPUTER FAILURE: NO DEGRADATION
- "WATCH DOG" PROGRAM IN SECOND CPU SUPPLIED
- SECOND CPU CAN BE BACKUP FOR EDCP (PURCHASE TDIF)
- THIS TYPE SYSTEM WILL BE SUPPORTED FOR GENERAL MARKET

12-16-75

3-2 DELIVERY SCHEDULE

COMPLETION PLANNING

- o RWC PSAT CONFIDENCE TEST
ONE(1) DAY - MID-JANUARY 1976

- o INTERNAL SOFTWARE DESIGN IMPLEMENTATION REVIEW
12-30 JANUARY 1976

- o FINAL RELEASE SOFTWARE SCHEDULE
 - UPDATED MANPOWER PLAN
 - UPDATED FUNCTIONS LIST
 - AGENCY REVIEW MID-FEBRUARY 1976

- o SUNNYVALE PSAT PLANNING
 - AGENCY TEST DEFINITION, ACCEPTANCE CRITERIA, PROCEDURE
MID-FEBRUARY 1976.
 - AMPEX INTERNAL TEST MINIMUM THIRTY(30) DAYS.
 - AGENCY TEST TARGET SCHEDULE MAY 1976.

12-16-75